

## Claims

- [c1] 1.A radio frequency (RF) coil array assembly for use in a magnetic resonance imaging (MRI) system comprising:  
a plurality of coils arranged in a configuration for transmitting in parallel during the transmission mode of the MRI system; and,  
a plurality of corresponding RF amplifiers each coupled to a corresponding coil, adapted to generating controlled currents in the coils and wherein the controlled currents being for defining and steering an excitation volume of an examined subject within the MRI system.
- [c2] 2.The transmit coil array assembly of claim 1 wherein the RF coils are arranged in a linear pattern.
- [c3] 3.The transmit coil array assembly of claim 1 wherein the RF coils are arranged in a substantially even distribution about the object.
- [c4] 4.The transmit coil array assembly of claim 3 wherein the RF coils are further arranged in a substantially circular pattern about the object.
- [c5] 5.The transmit coil array assembly of claim 1 wherein the currents are each controlled by a RF pulse waveform designed along with the gradient waveforms.
- [c6] 6.The transmit coil array assembly of claim 5 wherein the waveforms are designed to effect shorter time-span excitation k-space traversing by the means of reducing excitation k-space sampling density.
- [c7] 7.The transmit coil array assembly of claim 6 wherein the design is comprised of computing waveforms based on the desired shape and location of an excitation volume as well as profiles of the component coils' RF fields.
- [c8] 8.A method for magnetic resonance imaging (MRI) with multiple transmit coils, the method comprising:  
exciting a portion of an examined subject with the multiple transmit coils configured for parallel excitation; and,  
controlling respective currents in the multiple transmit coils to excite a selected portion of the object.

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- [c9] 9.The method of claim 8 wherein the multiple transmit coils transmit in parallel to accelerate a multi-dimensional excitation.
- [c10] 10.The method of claim 8 wherein the respective currents are each controlled by a RF pulse waveform designed along with the gradient waveforms.
- [c11] 11.The method of claim 8 further comprises the step receiving magnetic resonance (MR) signals from at least one radio frequency (RF) coil for generating images corresponding to the selected portion of the object.
- [c12] 12.The method of claim 11 wherein a body coil or a surface coil is used to receive signal.
- [c13] 13.The method of claim 11 wherein a MRI phased-array is used to receive signal.
- [c14] 14.The method of claim 11 wherein the coil array used during the transmission mode is further used to receive signal during the receive mode.
- [c15] 15. The method of claim 11 wherein a receive coil array is used to receive signal and is further configured for performing parallel acquisition.